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Strategic and Critical Minerals
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Good morning Madam Chair and distinguished Members of the Subcommittee. Thank you for the opportunity to testify on this critical issue to the United States Aerospace Specialty Metals Industrial Base.

My name is Bob Noel. I am a retired Ladish Co., Inc. executive with 39 years experience in the specialty metals business with the most recent position being Vice President of Business Development/Technology. I have also served as a Trustee of the Forging Industry Education and Research Foundation since 1989 and am currently Chairman of the Technology Roadmap Committee. Since February of 2002, I have served as Executive Advisor of the Metals Affordability Initiative (MAI) Consortium.

The purpose of my testimony will be to discuss Aerospace metals, US specialty metals industrial base, the importance of technology, and the Metals Affordability Initiative (MAI) Consortium performance, and the need for government support of the industrial base.

Metals and Applications

The key defense metals are aluminum beryllium, nickel base superalloys and titanium. The unique basic metal properties are further enhanced by key elemental alloying additions. All of these metals are derived from hardrock minerals, either domestic or foreign. As Hugh Hanes described in his testimony, metals represent the major portion of US military propulsion, aircraft, and space systems. Typical applications are shown for the F-22 aircraft, F-135 engine and a space rocket engine in Figures 1 though 3.

US Aerospace Specialty Metals Industrial Base

The industrial base that produces military systems consists of a supply chain of metal producers, component producer's, and original equipment manufacturers of propulsion and aircraft systems. The Metals Affordability Initiative (MAI) Consortium of 15 companies is most representative of the specialty metals industrial base. The member companies are Allegheny Technologies, Boeing, Bush Wellman, Carpenter Technologies, General Electric Aircraft Engines, Honeywell, Howmet Castings, Ladish, Lockheed Martin, Northrop Grumman, Pratt and Whitney, PCC, Rolls Royce, Special Metals and Timet. A minimum of two companies represents every element of the supply chain. These companies have manufacturing facilities through out the United States and are not concentrated in one region. The companies and their position in the supply chain are shown in Figure 4.

Industrial Base Consolidation

The entire specialty metals industrial base is affected by consolidation, downsizing to fit available business volume, globalization, and high capital cost needs. The impact has been most severe on the following metal and parts producers:

Metal Producers

· Allegheny Technologies (Oremet Titanium)

· Brush Wellman

· Carpenter

· Special Metals

· Timet

Component Producers
· Howmet Castings (An Alcoa Business)

· PCC Structurals (Acquired Wyman Gordon)

· Ladish

Titanium is a very important Aerospace metal. Manufacturing of Titanium sponge is the initial step in the metal production process. In 1990 there were three US sponge producers – Timet, RTI and Allegheny Techologies (Oremet) with combined capacity of 30,000 metric tons. Currently there is one domestic sponge producer – Timet with a capacity of 8600 metric tons. The US sponge capacity growth and decline are illustrated in Figure 5.

Ladish is a metal forging producer that was founded in 1905. It forges Aerospace metals for gas turbine engines (Propulsion), aircraft and space applications. Peak employment was 5300 employees in 1979. The current employment level in less than 800. Their business is focused on the high technology segment and is very capital intensive. The 10,000 ton isothermal press shown in Figure 6 is used primarily to produce nickel base superalloys for gas turbine engines and is used to illustrate the high equipment capital needs.

Industrial Base Perspective / Economic Performance

The Aerospace metal industry from 1990 to 2003 was affected by the following conditions:

1. US Aerospace Industrial Base Reductions

· OEM's reduced with very significant consolidation
· Metal suppliers and component producers also reduced

2. Global Factors

· Intense competition

· Foreign government industry investment

3. Technology Issues

· Company funded Research and Development declining

· Workforce/skills eroding with engineering talent availability concern

A general economic perception is that the Aerospace specialty metals businesses are performing well. A review of the metal and component producer's financial performance is illustrated in Table 1. The results show significantly lower stock prices caused by deteriorating financial performance. The five metal producers lost money. These suppliers produce 90% of the specialty metals for aerospace and defense industry. The declining financial performance has resulted in an average 35% reduction in Research and Development expenditures.

In an analysis of the industry and the competitive threats, an essential element is technology innovation. The Commission on the Future on the United States Aerospace Industry findings on the role of technology was " A recurring message we hear from the inputs the commission received is that investments in technology will

provide the KEY enablers to our nation's future aerospace capability…"

Metals Affordability Initiative Consortium

The Metals Affordability Initiative (MAI) Consortium was formally started in 1998. The objectives were to provide a source of funding to advance Metals Technology and maintain the US Defense Aerospace Specialty Metals Industrial Base. The theme is "Using Technology innovation to transform and sustain the Specialty Metals Industrial Base." The collaborating government agency is the Air Force Research Laboratories at Wright Patterson Air Force Base. The MAI consortium has grown to fifteen companies.

The Technology programs have been very successful with a projected return on government investment of over $650-million which exceeds 15 to 1. The government investment is supplemented by a minimum cost share of 25% or $16-million through FY03. A key to the technical success is collaboration. We also consider MAI as the template for Government-Industry Collaboration.

MAI currently has 14 active projects with the government funded component at $39-million, largely from Congressional additions to the DOD budget. The key technology projects with system interest and opportunities are:

· Electron Beam Melting of Titanium Slabs

· Friction Stir Welding
· Laser Additive Manufacturing

· Thin Wall structural Castings

· High Yield Casting of Turbine Airfoils

· Roll Forming of Engine Casings

The objective of MAI core technologies is to take metals and process technology concepts through manufacturing process demonstrations. The mature core programs are demonstrating technical success and meeting business case goals. The next step is insertion into military systems. The four technologies selected for insertion into the C-17 are illustrated in Figure 7. Each technology offers a total systems cost benefit. The application of these technologies is pervasive and can be applied to other systems such as the F-15 and C-130.

Airframe and propulsion systems have different engineering design considerations. Gas turbine engine components operate at higher temperatures and there is significant use of nickel base superalloys. The two processes identified for insertion into the F-135 are shown in Figure 8. The roll forming process can be used for titanium and superalloy cases. The casting process innovation being applied to airfoils will also result in a system performance improvement.

Summary and Conclusions

1. Aluminum, beryllium, nickel base superalloys, and titanium are essential for US military aircraft and space systems. These metals and their alloying elements are all derived from hardrock minerals.

2. The US Specialty Metals industrial base consists of metal producers, component producers, and OEM's with operations located throughout the US.

3. Both domestic aerospace and defense and critical civilian industries are dependent on a shrinking industrial base for their strategic and critical metal components.

4. The specialty metal producers showed financial losses in 2002 that are projected to continue in 2003.

5. The Metal Affordability Initiative (MAI) Consortium has demonstrated technology successes, a significant return on government investment obtained largely from Congressional additions to the DOD budget, and is working to insert the core technologies in defense systems.

6. The keys to transforming/sustaining the US specialty metals industrial base are technology innovation, government-industry collaboration, and a metals policy that includes financial support for core technology

programs and technology investment.

Madam Chair and distinguished Members of the Subcommittee, I sincerely appreciate the opportunity to testify before you and would be glad to answer any questions you may have.